Experiences of development of IT support systems for decommissioning of Fugen NPS

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Abstract

Fugen (ATR: Advanced Thermal Reactor) is a 165 MWe, heavy water moderated, light-water cooled, pressure-tube type reactor. After ca. 25 year operation, Fugen started decommissioning activities after the final shutdown in 2003 and the decommissioning project will lasts at least until 2034.

It is important to execute the decommissioning economically and rationally. Therefore, a systems engineering approach is necessary in order to optimize the workload, exposure dose, waste mass and cost by selecting appropriate dismantling plan at the planning stage of the decommissioning. Because the nuclear facilities have a large number of components and structures, it is necessary to evaluate the process effectively. For this reason, in order to make an efficient decommissioning plan, we have developed an IT support system for decommissioning by adopting new technologies such as 3-dimentional computer aided design (3D-CAD) and virtual reality (VR) named DEXUS [1].

After the approval of the decommissioning plan by the regulatory authority, we have started the decommissioning activities from dismantlement of turbine systems (which is slightly contaminated with radioactive material), designing remote-control systems of reactor removal by laser cutting, development of radioactive waste control system and application including the clearance method, etc.

By using IT support systems for these activities more than 10 years, we have been accumulating useful experiences and lessons-learned. The most important thing is the financial optimization. The decommissioning of a plant is non-profit and one-time-only activities, then the plan should be rationalized and the budge should be minimized as much as possible. In other words, we should consider cost-benefit for the computer systems development and implementation. A graded approach should be introduced in this point of view.

For example, 3D-CAD data is very useful for the planning of dismantling of highly radioactive materials such as reactor core, coupling with the robotics even the data creation is expensive. Moreover, when the radiation is relatively high but accessible to the material, we have to consider occupational dose at the planning of manual works. In this case, a simulation system such as VRdose [1] is very useful for the planning, training of workers in the realistic situation. However, if the radiation level is relatively low, the material is accessible, the detailed data and computer system may be unnecessary.

We have to keep up the new IT technologies, e.g. Augmented Reality (AR) is one of the useful technologies for the real field application. Knowledge management system (KMS) for the optimizing decommissioning and transfer and education of lessons learned to the next generation seems to be promising [2]. It takes in existing data, information and acquire valuable knowledge of workers and the knowledge can be reused and shared inside and outside of the community with minimum resources. We have started these activities.

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